

CLAIMS

1. Raman amplifier comprising at least one optical fiber and at least
5 one pump laser, optically coupled to said optical fiber, said pump laser
being adapted for emitting a pump radiation at a wavelength λ_p , wherein
said optical fiber comprises a tellurite glass suitable for enhancing Raman
effect, said glass comprising:
from 50% to 90%, in mole percentage of TeO_2 ;
10 from 5% to 45% in mole percentage of a first metal oxide of an
element selected from the group consisting of : Nb, W, Ti, Ta, and Mo;
from 5% to 30% in mole percentage of a second different metal oxide
of an element selected from the group consisting of : Nb, W, Ti, Pb, Sb,
In, Bi, Tl, Ta, Mo, Zr, Hf Cd, Gd, La, Ba.
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2. Raman amplifier according to claim 1, wherein the mole percentage
of TeO_2 in said glass is from 65% to 85%.
3. Raman amplifier according to claim 1, wherein the mole percentage
20 of said first metal oxide is from 5% to 30%.
4. Raman amplifier according to claim 1, wherein the mole percentage
of said first metal oxide is from 10% to 25%..
- 25 5. Raman amplifier according to claim 1, wherein the mole percentage
of said second metal oxide is from 5% to 20%.
6. Raman amplifier according to claim 1, wherein said tellurite glass
further comprise an oxide of a metal selected from the group consisting
30 of Y, Sc, Al, Ga, Ge, P, Li, Na, K, Rb, Cs, Mg, Ca, Sr, Be, B, Zn.
7. Raman amplifier according to claim 1, wherein said first oxide is an
oxide of an element selected from the group consisting of Nb, W and Ti.

8. Raman amplifier according to claim 1 or 7, wherein said second oxide is an oxide of an element selected from the group consisting of Nb, W and Ti.

5 **9.** Raman amplifier according to claim 1, wherein said tellurite glass comprises from 50% to 90% in mole percentage of TeO_2 , from 5% to 30% in mole percentage of niobium oxide and from 5% to 30% in mole percentage of tungsten oxide.

10 **10.** Raman amplifier comprising at least one optical fiber and at least one pump laser, optically coupled to said optical fiber, said pump laser being adapted for emitting a pump radiation at a wavelength λ_p , characterized in that said optical fiber comprises a tellurite glass suitable for enhancing Raman effect, said glass comprising:

15 from 55% to 95% in mole percentage of TeO_2 ;
 from 5% to 45% in mole percentage of a metal oxide of an element selected from the group consisting of : Nb, Ti, Ta, and Mo.

11. Raman amplifier according to claim 10, wherein said tellurite glass
20 comprises from 65% to 95% in mole percentage of TeO_2 .

12. Raman amplifier according to claim 10, wherein said tellurite glass comprises from 5% to 35% in mole percentage of said metal oxide.

25 **13.** Optical telecommunication link including an optical fiber path for transmitting an optical signal and at least a Raman amplifier as defined according to any of the preceding claims, optically coupled along said optical fiber path.

30 **14.** Optical fiber for Raman amplification comprising a glass composition which comprises:
 from 50% to 90% in mole percentage of TeO_2 ;
 from 5% to 45% in mole percentage of a first metal oxide of an element selected from the group consisting of : Nb, W, Ti, Ta, and Mo;

from 5% to 30% in mole percentage of a second different metal oxide of an element selected from the group consisting of : Nb, W, Ti, Pb, Sb, In, Bi, Tl, Ta, Mo, Zr, Hf Cd, Gd, La, Ba;

said composition being substantially free of erbium.

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15. Optical fiber according to claim 14 wherein said first oxide is an oxide of an element selected from the group consisting of Nb, W and Ti.

16. Optical fiber according to claim 14 or 15 wherein said second
10 oxide is an oxide of an element selected from the group consisting of Nb, W and Ti.

17. Optical fiber according to claim 14 wherein said glass comprises
15 from 50% to 90% in mole percentage of TeO_2 , from 5% to 30% in mole percentage of niobium oxide and from 5% to 30% in mole percentage of tungsten oxide.

18. Optical fiber for Raman amplification comprising a glass composition which comprises:
20 from 55% to 95% in mole percentage of TeO_2 ;
from 5% to 45% in mole percentage of a metal oxide of an element selected from the group consisting of : Nb, Ti, Tl, Ta, and Mo;
said composition being substantially free of erbium.

19. Optical fiber according to any of the preceding claims 14 to 18,
25 wherein said glass composition has a thermal stability index $T_x - T_g$ higher than 125°C .

20. Optical fiber according to claim 19 wherein said thermal stability
30 index $T_x - T_g$ is higher than 150°C .

21. Optical fiber according to claim 19 wherein said thermal stability index $T_x - T_g$ is higher than 160°C .

22. Optical fiber according to any of the claims 14 to 21 wherein said glass composition shows a maximum Raman gain higher than 100 times with respect to pure silica glass.

5 **23.** Optical fiber according to claim 22, wherein said glass composition shows a maximum Raman gain higher than 120 times with respect to pure silica glass.

10 **24.** Optical fiber according to any of the claims 14 to 23 the total cross-section of the Raman emission spectrum of said glass composition in the frequency shift range of from 200 cm^{-1} to 1080 cm^{-1} is at least 100 times greater with respect to the total cross-section of the Raman emission of pure silica in the same frequency shift range.

15 **25.** Optical fiber according claim 23 wherein said total cross-section of the Raman emission spectrum of said glass composition at least 120 times greater with respect to the total cross-section of the Raman emission of pure silica in the same frequency shift range.

20 **26.** Optical fiber according claim 24 wherein said total cross-section of the Raman emission spectrum of said glass composition at least 150 times greater with respect to the total cross-section of the Raman emission of pure silica in the same frequency shift range.

25 **27.** Optical fiber according to any of the preceding claims 14 to 26, comprising a core portion and a cladding portion, wherein at least said core portion is made from a tellurite glass as defined in any of said claims 14 to 26.

30 **28.** Method for increasing at least one of the parameters selected among Raman bandwidth broadening and thermal stability of a binary glass composition including tellurium oxide and a first metal oxide of an element selected among Nb, W, Ti, Ta, and Mo which comprises preparing a ternary glass composition comprising said tellurium oxide,
35 said first metal oxide and a predetermined amount of a second different

metal oxide of an element selected among Nb, W, Ti, Pb, Sb, In, Bi, Tl, Ta, Mo, Zr, Hf Cd, Gd, La, Ba.